

UTILIZATION OF SPRAY ON FOAM INSULATION FOR
MANNED AND UNMANNED SPACECRAFT AND STRUCTURES

BY

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ABSTRACT

This paper will explore the idea of using spray on foam insulation as a passive thermal and micrometeorite protection system. Examples of its application, utilization and benefits are addressed.

When the United States begins the development of large space structures (Space Station, Lunar base, Mars missions and large space factories), there will be two requirements common to all these designs: the need for a lightweight and passive micrometeorite and thermal protection system. One such possible solution to both these requirements is a stable, strong type of spray on foam insulation.

The benefits of applying an exterior coating of foam insulation can be:

1. The foam can provide a thermally stable shield that can assist in reducing the strain on traditional space radiator systems. It can also act as a passive thermal guard, allowing a greater fault tolerance if the standard system should fail.

2. The foam can act as an ablative shell diminishing the effects of natural and manmade debris striking the structure.

3. The foam can provide a lightweight passive shield with a general weight of $\frac{1}{2}$ ounce per 1ft². This is highly attractive from the position of design.

4. Cost: a spray on foam system can represent a significant cost-effective design.

5. Maintenance: the maintenance of such a system will be minimal and simple to carry out.

6. A stable material that does not react when exposed to Earth or Lunar space environment. (The Thermal Blanket insulation originally developed for the Galileo Jupiter mission was found to deteriorate when exposed to atomic oxygen in low Earth orbit.)

When one considers that current solutions to this problem include Armored Skins, Thermal Blankets and Louvers, the obvious and practical applications of foam insulation in fulfilling each of these requirements represents a simple, complete and cost-effective method for meeting the requirements of thermal and meteorite protection.